WHAT IS CLAIMED IS:

1. Piezoelectric ceramics having a thickness of 100 μm or less, surface flatness of 20 μm or less and maximum surface unevenness of 3 μm or less, wherein in-plane variation in dielectric constant is 5% or less of an average dielectric constant.

2. Piezoelectric ceramics according to claim 1, which has the surface having surface flatness Ra of 3 μm or less.

3. Piezoelectric ceramics according to claim 1, which comprise a perovskite compound containing Pb.

4. Piezoelectric ceramics according to claim 1, which contains 0.1% by weight or less of carbon.

5. Piezoelectric ceramics according to claim 1, wherein an average value of a piezoelectric strain constant d_{31} is 150 pm/V or more and in-plane variation in d_{31} is 10% or less of the average value.

6. A method of manufacturing piezoelectric ceramics, which comprises firing a green compact comprising a piezoelectric ceramic powder while contacting with the surface of a supporting member whose surface having porosity of 5% or less and flatness of 20 μm or less.

7. The method of manufacturing piezoelectric ceramics according to claim 6, wherein the

piezoelectric ceramics have surface flatness Ra of 3 μm or less.

8. The method of manufacturing piezoelectric ceramics according to claim 6, wherein the green compact is fired while being interposed between a pair of the supporting members.

9. The method of manufacturing piezoelectric ceramics according to claim 6, wherein the supporting member contains a crystal of at least one kind selected from the group consisting of alumina, beryllia, zirconia, magnesia, mullite, spinel structure, bismuth layer-structured compound, compound of tungsten bronze structure, compound of Pb-based perovskite structure, compound of niobium-based perovskite structure and compound of tantalum-based perovskite structure.

10. The method of manufacturing piezoelectric ceramics according to claim 6, wherein the supporting member comprises zirconia containing at least one kind selected from the group consisting of CaO, MgO, Y_2O_3 and rare earth elements.

11. The method of manufacturing piezoelectric ceramics according to claim 6, wherein the crystal constituting the supporting member has an average grain size of 5 to 30 μm.

12. The method of manufacturing piezoelectric ceramics according to claim 6, wherein the green compact comprising a stock material powder of a perovskite compound containing Pb is fired while being inserted into a sealed space.

13. The method of manufacturing piezoelectric ceramics according to claim 12, which satisfies the relations represented by the following expressions (1) and (2):

$$1.0001 \times (V2+V3) \leqq V1 \leqq 4.0000 \times (V2+V3) \quad (1)$$

$$0.02 \times V3 \leq V2 \leq 50 \times V3 \quad (2)$$

where V1 denotes a volume of a sealed space, V2 denotes a volume of a heavy object and V3 denotes a volume of a green compact, when a heavy object having surface roughness Ra of 1 μm or less, flatness of 20 μm or less and a volume V2 is placed on a green compact having a volume V3 and they are inserted into a sealed space having a volume V1.

14. An actuator comprising a piezoelectric substrate comprising the piezoelectric ceramics of claim 1, a plurality of surface electrodes provided on the surface of the piezoelectric substrate, and an internal electrode provided inside the piezoelectric substrate.

15. The actuator according to claim 14, wherein the piezoelectric ceramic contains Pb and the internal electrode contains Ag.

16. A printing head comprising a supporting substrate comprising ink flow passages provided inside, and the actuator of claim 14 provided on the supporting substrate via an adhesive layer.

17. An actuator comprising a piezoelectric substrate comprising a plurality of piezoelectric ceramics layers and a plurality of displacement elements provided on the surface of the piezoelectric substrate, and the displacement elements comprises a pair of electrodes and a piezoelectric layer interposed between the electrodes, wherein a thickness of the piezoelectric ceramics layers and the piezoelectric layer is 50 μm or less, a total thickness is 100 μm or less, and in-plane variation in total thickness are 10% or less.

18. The actuator according to claim 17, wherein the thickness of the electrodes is from 0.5 to 5 μm.

19. The actuator according to claim 17, wherein the thickness of the piezoelectric ceramics layers and the piezoelectric layer is from 5 to 15 μm or less and the total thickness is from 20 to 60 μm or less.

20. A method of manufacturing an actuator, which comprises:

a mixing step of a piezoelectric ceramic powder having an average grain size of 1 μm or less and an organic binder component to prepare a slurry for formation of a tape,

a forming step of forming the slurry for formation of a tape obtained in the mixing step into a green sheet by a tape forming process,

a pressing step of pressing the green sheet obtained in the forming step,

a laminating step of applying electrodes on the green sheet obtained in the pressing step and laminating the green sheets to obtain a laminated green compact, and

a firing step of firing the laminated green compact obtained in the laminating step.

21. The method of manufacturing an actuator according to claim 20, wherein pressing is conducted by at least one method selected from roll pressing method, plane pressing method and hydrostatic pressing method in the pressing step.

22. The method of manufacturing an actuator according to claim 20, wherein a pressure in the pressing step is from 10 to 100 MPa.

23. The method f manufacturing an actuator according t claim 20, wherein a temperature during pressing in the pressing step is from 0 to 300°C.

24. The method of manufacturing an actuator according to claim 20, wherein variation in thickness of the green sheet obtained in the pressing step is 15% or less.

25. A printing head comprising a supporting substrate comprising ink flow passages provided inside, and the actuator of claim 17 provided on the supporting substrate via an adhesive layer.

26. The actuator according to claim 14, wherein the piezoelectric substrate has the surface whose surface roughness Ra is 3 μm or less.

27. The actuator according to claim 14, wherein the piezoelectric ceramics contain 0.1% by weight or less of carbon.

28. A method of manufacturing an actuator, which comprises firing a plurality of green compacts comprising a piezoelectric ceramic powder and a plurality of supporting members which are laminated mutually, and each supporting member has the surface which has porosity at surface portion of 1% or less and flatness of 20 μm or less.

29. An ink jet printer comprising the printing head of claim 16, paper feeding means for feeding a paper printing medium to be printed to the printing head, and paper ejecting means for ejecting the printing medium printed using the printing head.

30. An ink jet printer comprising the printing head of claim 25, paper feeding means for feeding a paper printing medium to be printed to the printing head, and paper ejecting means for ejecting the printing medium printed using the printing head.